

## CLAIMS

### WHAT IS CLAIMED IS:

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1. A self-compensating laser resonator comprising:
- a first reflecting apparatus comprising a first reflecting surface and a second reflecting surface disposed at a right angle to each other;
  - a second reflecting apparatus facing said first reflecting apparatus and comprising a third reflecting surface and a fourth reflecting surface disposed at a right angle to each other;
  - a laser medium provided between said first reflecting surface and said third reflecting surface; and a light source for exciting said laser medium, wherein,
    - a second ridge formed by two planes comprising said third and fourth reflecting surfaces is on a plane substantially orthogonal to a first ridge formed by two planes comprising said first and second reflecting surfaces, characterized in that,
    - a laser beam emanating from said laser medium and traveling toward said first reflecting surface is successively reflected by said first, second, third, fourth, second, first, fourth and third reflecting surfaces to again enter said laser medium.
2. A self-compensating laser resonator according to Claim 1 characterized in that, an isolator which allows a laser beam to pass there-through in only one direction is provided in an optical path of said a laser beam.
3. A self-compensating laser resonator according to Claim 1 characterized in that, a partially reflective mirror used for laser output is provided at any one of said first to fourth reflecting surfaces.
4. A self-compensating laser resonator according to Claim 1 characterized in that, polarizing reflecting means for selectively allowing to pass there-through to be output

to an outside portion any one of a P polarization component and an S polarization component of a laser beam while reflecting said other component is provided at any one of said first to fourth reflecting surfaces, and

polarization component adjusting means for dividing said laser beam relative to said polarizing reflecting means into said P polarization component and said S polarization component at an arbitrary ratio is provided in an optical path of said laser beam.

5. A self-compensating laser resonator according to Claim 1 characterized in that, polarizing reflecting means for selectively allowing to pass there-through any one of a P polarization component and an S polarization component of a laser beam while reflecting said other component to be output to an outside portion is provided, and

polarization component adjusting means for dividing said laser beam relative to said polarizing reflecting means into said P polarization component and said S polarization component at an arbitrary ratio is provided in an optical path of said laser beam.

6. A self-compensating laser resonator according to Claim 1 characterized in that, an isolator for passing a laser beam there-through in only one direction, comprising, two polarization component adjusting means for selectively allowing to pass there-through any one of a P polarization component and an S polarization component of a laser beam while reflecting said other component to be output to an outside portion, a Faraday rotator and a half wave plate, and,

polarization component adjusting means for dividing said laser beam relative to said polarizing reflecting means into said P polarization component and said S polarization component at an arbitrary ratio is provided.

- a 7. A self-compensating laser resonator according to ~~any one of Claims 4 to 6~~ characterized in that, said polarization component adjusting means is a half wave plate.

a 8. A self-compensating laser resonator according to ~~any one of Claims 4 to 6~~ characterized in that, said polarization component adjusting means is a birefringent optical element capable of achieving a birefringence effect in accordance with an applied voltage.

a 9. A self-compensating laser resonator according to ~~any one of Claims 4 to 6~~ characterized in that, a Seeder light generating apparatus for making Seeder light incident in an optical path of a laser beam reflected from said polarization reflecting means is provided.

002250" STE 9/2560 a 10. A self-compensating laser resonator according to ~~any one of Claims 1 to 6~~ characterized in that, a beam diameter converting device for converting a beam diameter of a laser beam is provided.

11. A self-compensating laser resonator comprising:  
a first reflecting apparatus having a first reflecting surface and a second reflecting surface disposed at a right angle to each other;  
a second reflecting apparatus facing said first reflecting apparatus and having a third reflecting surface and a fourth reflecting surface disposed at a right angle to each other;  
a third reflecting apparatus provided between said second and fourth reflecting surfaces, having a fifth reflecting surface and a sixth reflecting surface disposed parallel to, and facing away from, each other;  
a laser medium provided between said first and third reflecting surfaces;  
and a light source for exciting said laser medium, wherein,  
a second ridge formed by two planes comprising said third and fourth reflecting

surfaces is on a plane substantially orthogonal to a first ridge formed by two planes comprising said first and second reflecting surfaces, characterized in that,

a laser beam emanating from said laser medium and traveling toward said first reflecting surface is successively reflected by said first, second, third, fourth, fifth, fourth, third, second and first reflecting surfaces to again enter said laser medium, passes through said laser medium and is further successively reflected by said third, fourth, first, second, sixth, second, first, fourth and third reflecting surfaces to once again enter said laser medium.

12. A self-compensating laser resonator according to Claim 11 characterized in that, said third reflecting apparatus comprises two single-sided reflecting mirrors mutually fixed by a holder and disposed such that reflecting surfaces thereof are parallel and face in opposite directions from each other.
13. A self-compensating laser resonator according to Claim 11 characterized in that, said third reflecting apparatus comprises a reflecting mirror having a two-sided reflecting surface on one surface thereof for reflecting a laser beam with a front surface and a rear surface.
14. A self-compensating laser resonator comprising:  
a first reflecting apparatus having a first reflecting surface and a second reflecting surface disposed at a right angle to each other;  
a second reflecting apparatus facing said first reflecting apparatus and having a third

reflecting surface and a fourth reflecting surface disposed at a right angle to each other;

a laser medium having a seventh two-sided reflecting surface on an optical axis of a laser beam on one end surface thereof provided between said first and third reflecting surface;

and a light source for exciting said laser medium, wherein,

a second ridge formed by two planes comprising said third and fourth reflecting surfaces is on a plane substantially orthogonal to a first ridge formed by two planes comprising said first and second reflecting surfaces, characterized in that,

a laser beam emanating from said laser medium and traveling toward said first reflecting surface is successively reflected by said first, second, third, fourth, second, first, fourth, third and seventh two-sided reflecting surfaces, is further successively reflected by said third, fourth, first, second, fourth, third, second and first reflecting surfaces to again enter said laser medium, passes through said laser medium and is reflected by said seventh two-sided reflecting surface.

15. A self-compensating laser resonator comprising:

a first reflecting apparatus having a first reflecting surface and a second reflecting surface disposed at a right angle to each other;

a second reflecting apparatus facing said first reflecting apparatus and having a third reflecting surface and a fourth reflecting surface disposed at a right angle to each other;

a laser medium provided between said first and third reflecting surfaces;

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a light source for exciting said laser medium;  
and an optical component having an eighth two-sided reflecting surface on an optical axis of a laser beam on one end surface thereof provided between second and fourth reflecting surfaces, wherein

a second ridge formed by two planes comprising said third and fourth reflecting surfaces is on a plane substantially orthogonal to a first ridge formed by two planes comprising said first and second reflecting surfaces, characterized in that,

a laser beam emanating from said laser medium and traveling toward said first reflecting surface is successively reflected by said first, second, third, fourth, eighth two-sided, fourth, third, second and first reflecting surfaces to again enter said laser medium, passes through said laser medium, is further successively reflected by said third, fourth, first and second reflecting surfaces to be incident on said optical component, and is further successively reflected by said eighth two-sided, second, first, fourth and third reflecting surfaces to once again enter the laser medium.

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16. A self-compensating laser resonator according to ~~any one of Claims 1 to 6, or 11 to 15~~ characterized in that,

said first and second reflecting apparatuses each have two flat reflecting mirrors disposed at a right angle to each other.

17. A self-compensating laser resonator according to Claim 16 characterized in that, said two flat reflecting mirrors disposed at a right angle to each other are disposed with a gap therebetween and are joined to one another by means of a joining member.

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18. A self-compensating laser resonator according to ~~any one of Claims 1 to 16, or~~  
~~11 to 15~~ characterized in that,
- said first reflecting apparatus and second reflecting apparatus each comprise a prism having two reflecting surfaces disposed at right angles to each other and an incident surface of the laser beam.
19. A self-compensating laser resonator comprising:
- a first prism having first and second reflecting surfaces disposed at right angles to each other and a first incident surface of the laser beam;
  - a second prism facing said first prism and having third and fourth reflecting surfaces disposed at right angles to each other and a second incident surface of the laser beam, and comprising a ninth two-sided reflecting surface on an optical path of the laser beam incident on the second incident surface;
  - a laser medium provided between said first and third reflecting surface;
  - and a light source for exciting said laser medium, wherein,
- a second ridge formed by two planes comprising said third and fourth reflecting surfaces is on a plane substantially orthogonal to a first ridge formed by two planes comprising said first and second reflecting surfaces, characterized in that,
  - a laser beam emanating from the laser medium and traveling toward said first reflecting surface is successively reflected by the first, second, third, fourth, second, first, ninth two-sided, first, second, fourth, third, second and first reflecting surfaces to again enter the laser medium, passes through the laser medium, and is further

successively reflected by the third, fourth, ninth two-sided, fourth and third reflecting surfaces to once again enter the laser medium.

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20. A self-compensating laser resonator according to Claim <sup>18</sup>~~19~~ characterized in that,

said first and second ridges of the first and second prisms are eliminated.

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